

Danthonia



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NEWSLETTER OF THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION INC.

Mundulla Yellows: A growing concern

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In the late 1970s Geoff Cotton, an observant beekeeper, noticed unusual yellowing of the foliage on a few mature red gums (*Eucalyptus camaldulensis*) at Buckingham (near Mundulla) in the south-east of South Australia. By 1990 some of the trees showing the yellow foliage were dead and adjacent trees were showing the symptoms. Other eucalypts in the region were also showing symptoms, particularly along roads in and around the towns of Keith and Bordertown.

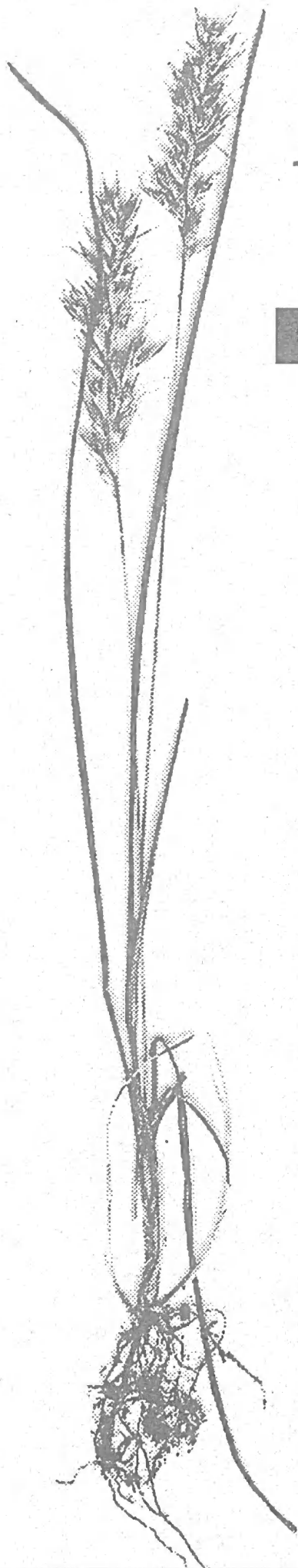
A 1992-93 survey of the health of hundreds of eucalypts in the Keith-Bordertown area (Paton & Eldridge 1994; Paton *et al.* 1999) showed that trees showing symptoms of Mundulla Yellows (patches of yellow foliage on one or more branches or sub-branches with inter-veinal chlorosis of the leaves) were largely found along roadways or waterways.

A survey of sections of roadside vegetation between 1994 and

1999 showed that of 477 eucalypts examined, none recovered over the five-year period. While some were about the same, most had deteriorated and a reasonable proportion had died (Table 1). The conclusion from these figures is that once a plant shows symptoms of Mundulla Yellows its condition deteriorates and death is inevitable, although it may take 10 or more years. It is likely that all of these trees will be dead within 10-20 years. Furthermore, the only eucalypt seedling to establish along these roadsides over the last five years also contracted Mundulla Yellows, severely dampening any thoughts of ever being able to re-tree these areas.

A range of possible treatments was tried, involving injecting infected trees with either phosphorous acid, tetracycline, rogor or aquasol nutrient solution. No obvious recovery was found, although the ability to record a response was limited

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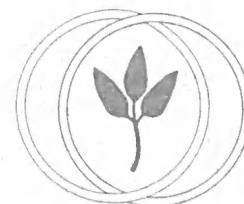
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Contributing to Danthonia

Danthonia is a forum for information exchange for all those involved in plant conservation: please use it to share your work with others. Articles, information snippets, details of new publications and diary dates are all welcome. The deadline for the June 2000 issue is Friday 28th April.

Please send typed or handwritten articles, no more than 2 A4 pages, to Fiona Hall by fax, mail, e-mail, or diskette. If sending by e-mail, please send in the body of the text or as an attachment in Word 6 or Rich Text Format (rtf) to anpc@anbg.gov.au

Illustrations or logos are always needed too, in the form of clear prints, slides or drawings.

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Royal Botanic Gardens
Melbourne

National Coordinator's Report

13 APR 2000

Jeanette Mill

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In late September I presented a paper on the ANPC at the *Strategies for Survival Ex Situ Plant Conservation Symposium*, hosted by Chicago Botanic Garden (CBG), and jointly organised by CBG, Berry Botanic Garden (BBG), the Center for Plant Conservation (all US organisations), and Royal Botanic Gardens, Kew (RBG Kew). My attendance was possible due to generous sponsorship from conference organisers. The aim of the symposium was "to stimulate discussion between *ex situ* providers and consumers, review best practices, and help create more effective integrated plant conservation activities at all levels, from the local to the global."

The first day of papers included an impressive array of peak bodies and *ex situ* programs from around the world. The lead paper was co-authored by Dr Mike Maunder (RBG Kew), Dr Kayri Havens (CBG) and Ed Guerrant (BBG). Next Don Falk (Society for Ecological Restoration) gave a paper on integrating *ex situ* resources into restoration strategies. Don is one of the leading proponents of integrated conservation, and one of the sources of inspiration for the ANPC's internationally renowned model of integrated conservation. It is this international renown that led to my invitation to present a paper on the ANPC at the conference, and I received enormous amounts of positive feedback about the ANPC during the conference.

Conference sessions under the theme *How is ex situ conservation being practiced around the world?* included papers on rare and endangered species by Dr Peter Wyse Jackson of Botanic Gardens Conservation International, my own paper on the ANPC, and a paper on the Species Survival Commission's focus on hotspots of diversity and networks, co-authored by Dr Wendy Strahm, SSC and Dr Mike Maunder. Culturally and economically important plants and their relatives were discussed in a few papers, and Australia was also represented by Anne Cochrane of WA Dept of Conservation and Land Management, in a paper on WA's integrated conservation strategy. Dr Peter Raven presented a global view, incorporating comments from the recent International Botanic Congress.

The technical management of *ex situ* conservation



Conference delegates at Chiwaukee Prairie. Marlin Bowles is 5th from right. Photo: Jeanette Mill

collections was covered on the second day. Topics included genetic change in *ex situ* collections and *ex situ* conservation methods for bryophytes and pteridophytes. The final day was devoted to small group discussions.

During the conference we visited the Chiwaukee Prairie, guided expertly by Marlin Bowles (Morton Arboretum). Prairies are reduced to a mere fragment of their former range. Only 809 hectares of high quality prairie remain in Illinois of the original 8.9 million hectares – less than one one hundredth of one percent (Robertson, 2000). The diversity of species is staggering, with over 400 species found in this 143 hectare reserve. This figure includes 10 state-threatened plant species, and the reserve contains seven additional state significant communities or other features.

We also visited the Illinois Beach Nature Preserve, site of a recovery project for the Federally Threatened (and previously presumed extinct) Pitcher's Thistle, *Cirsium pitcheri* (Bowles et al, 1993). The thistle is being reintroduced into suitable habitat in the reserve, and recruitment rates are being monitored.

Chicago Botanic Garden has recreated six prairie communities in a six hectare area at the gardens. Along with the Endangered Species Garden, this was the highlight of the CBG for me and an excellent tool for research and public awareness-raising of the ecological importance of prairies.

En route to Chicago I visited RBG Kew to present a paper at the International Diploma in Plant Conservation Techniques Course, on plant

(Continued on page 5)

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because the local council pruned many of the test trees. It was also found that the numbers and types of birds using the trees declined as the trees lost vigour (Paton *et al.* 1999).

By 1999 all of the species of native shrubs found along the sections of road had also suffered from Mundulla Yellows, including species of *Allocasuarina*, *Xanthorrhoea*, *Melaleuca*, *Bursaria*, *Dianella* and *Acacia*, and some had contracted the symptoms and died over the five year period (notably *Acacia*, *Xanthorrhoea*, *Dianella*, and *Allocasuarina*). For these sections of road, then, there will soon be no eucalypts and no native understorey shrubs left alive, and the landscape and aesthetics of the area will change dramatically.

This loss of trees and shrubs is no longer restricted to just a few locations in the south-east of South Australia. Recent reconnaissance surveys reveal that plants expressing the symptoms are now widespread in SA, not to mention being reported from Western Australia, New South Wales, Tasmania, Victoria and the Northern Territory as well. If left unchecked, Mundulla Yellows has the potential to devastate the native vegetation of SA, significantly reduce biodiversity, contribute to problems of increased dryland salinisation and lead to substantial reductions in agricultural productivity, including threatening agro-forestry, since commonly planted eucalypts, like *E. globulus*, are susceptible to Mundulla Yellows. Mundulla Yellows will also affect amenity plantings in



Eucalypt leaves (l) showing the interveinal chlorosis typical of Mundulla Yellows. Photo: David Paton

urban areas and detract from tourism.

Furthermore, Mundulla Yellows attacks trees and shrubs of all ages including seedlings and saplings in revegetation programs and so threatens much of the work initiated under Natural Heritage Trust revegetation programs.

At present the likely causal agent appears to be a phytoplasma (an organism that lives inside plant cells), possibly transmitted by sap-sucking insects. Phytoplasmas have caused similar yellowing symptoms and mortality in other plants including native cabbage trees in New Zealand, and they have recently been isolated from eucalypt tissue showing the symptoms of Mundulla Yellows, but considerably more work is required to demonstrate that a phytoplasma is the causal agent. Funds have recently been allocated by Environment Australia for plant

Table 1. Changes in the percent of trees showing symptoms of Mundulla Yellows and fate of five species of eucalypt examined along three 1-km sections of roadside in the Keith-Bordertown area in 1994 and 1999.

Species of plant	Number examined	% plants dead		% plants with Mundulla Yellow	
		1994	1999	1994	1999
<i>Eucalyptus camaldulensis</i>	245	20	35	73	93
<i>Eucalyptus leucoxylon</i>	69	3	6	70	100
<i>Eucalyptus fasciculosa</i>	76	0	4	78	99
<i>Eucalyptus incrassata</i>	78	3	19	79	100
<i>Eucalyptus leptophylla</i>	9	0	33	56	100

pathologists like Professor John Randles to determine if phytoplasmas or some other biotic agent(s) are involved and to develop a diagnostic test for Mundulla Yellows.

Until the causal agent(s) and method of dispersal are identified and appropriate remedial action found, untold and irreparable damage to the Australian environment will occur.

References

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Paton, D.C., Prescott, A.M., Davies, R. J-P. and Heard, L.M. (1999). The distribution, status and threats to temperate woodlands in South Australia. In R.J. Hobbs & C.J. Yates (eds). *Temperate Eucalypt Woodlands in*

Australia. Biology, Conservation, Management and Restoration. Surrey Beatty & Sons, Chipping Norton.

Other resources on Mundulla Yellows

The Conservation Council of South Australia (120 Wakefield St. Adelaide) has the following information available (contact Robyn on (08) 8223 5155):

- *A field guide to Mundulla Yellows: a newly reported disease spreading among eucalyptus and other native species*. Published 1999. University of Adelaide. Price \$3
- *Mundulla Yellows: a new threat to our native vegetation - meeting the challenge*. Proceedings of a forum organised by the Conservation Council SA and the University of Adelaide, 27 Aug 1999.

(Coordinator's report, continued from page 3)

conservation in Australia and the ANPC. Students from many countries had assembled for the eight week course conducted by Mike Maunder, Colin Clubbe and staff of the Conservation and Education Units. I repeated the presentation for IUCN, Traffic International and the World Conservation Monitoring Centre in Cambridge.

Peter and Diane Wyse Jackson and family were my excellent hosts in London. It was wonderful to be able to visit the headquarters of Botanic Gardens Conservation International and discuss increased collaboration on projects, further strengthening the linkages between BGCI and ANPC. Space does not permit me to elaborate any more on the UK leg of my trip; however, we hope to bring you more detailed information about many of the initiatives mentioned above in future issues of *Danthonia*.

For further information visit the following websites:

Strategies for Survival Symposium: <http://mtf.bloominc.org/chs/dev/>. The site includes a survey on reintroduction issues.

Conservation Projects Development Unit at RBG Kew: <http://www.rbgkew.org.uk/conservation/cpdu/cpdu.html>

These sites and others published in *Danthonia* are, or will be, linked to the ANPC Internet Directory of Plant Conservation Resources: <http://www.anbg.gov.au/anpc/web.html>.

References

The ANPC office has copies of all the references listed below:

Bowles, M, Flakne, R, McEachern, K and Pavlovic, N. 1993. Recovery planning and reintroduction of the federally threatened Pitcher's Thistle (*Cirsium pitcheri*) in Illinois. *Natural Areas Journal*, 13 (3).

Robertson, K.R. 2000. The Tallgrass Prairie. *Plant Talk*, January 2000, 20:21-25.

Wisconsin Department of Natural Resources 1989. *Chiwaukee Prairie State Natural Area (No 54)*. Bureau of Endangered Resources.

Further Reading

Packard, S. and Mutel, C. 1997. *The Tallgrass Restoration Handbook*. Island Press.

Acknowledgment

Thank you to Kayri Havens for assistance with information for the article, and for providing accommodation in Chicago.

Can the Market Deliver Nature Conservation? Nature's Choice in Tasmania

Sean Cadman

Bushcare Community Extension Officer, Central North and Midlands, Tasmania

There is a growing trend globally, especially in Europe, for large supermarket chains to demand that food products are quality assured (environmentally friendly). This trend has been driven largely by consumer concerns, initially about agricultural chemical use and animal welfare, and more recently about genetically modified organisms/foodstuffs. Furthermore, there is increasing awareness that sustainable mechanisms are needed for protecting biodiversity on private land – there is a limit to what can be achieved through the protected area system, and reliance on short-term funded projects is not the most sustainable approach.

Despite some growth in Australia in the market for biodynamic and organic produce, most Australian producers and the supermarkets have focused on ISO 14000-based approaches. These approaches are similar to those used in the ecologically sustainable forest management assessment process to develop Regional Forest Assessments (see references at the end of this article). They generally tell you that an approved system is in place and that it includes some level of compliance monitoring. However, there is a growing recognition, especially in Europe, that these approaches tell consumers very little about what actually happens on the land that is being managed to produce food or timber.

Nature's Choice

Nature's Choice is an 'environmentally friendly' food labelling scheme used by TESCO, the UK's largest supermarket chain. Through this scheme, accredited growers' farms are audited against seven criteria, the most significant of which is that growers have to demonstrate that they are maintaining and enhancing the nature conservation and landscape values of their properties.

Last year, Tasmania's onion producers joined the scheme. Tasmania is a large exporter of fresh vegetable produce, and Field Fresh, the largest exporter of vegetables, has been providing onions to TESCO for a number of years. TESCO sought

to have Field Fresh onions quality assured using their Nature's Choice scheme. Bushcare was contracted to carry out the property assessments and make recommendations for maintaining and enhancing wildlife. This also involved the identification of properties with potential for Land for Wildlife registration. The final audit was conducted by an independent quality assurer who assessed the growers on the basis of the commitment they were prepared to make towards nature conservation. As this was the first year, growers were not expected to have undertaken management works for the nature conservation component but will be audited for compliance in future years. In the meantime, Land for Wildlife registration is used as one indicator of commitment. As lethal wildlife control is allowed in Tasmania, the Game Management Unit of Department of Primary Industries, Water and Environment provided Game Management Plans for growers wishing to undertake wildlife management. All other growers were provided with logbooks to collect information about wildlife species and populations on the farms.

Farmers successfully participating in the scheme will receive a small price premium for their onions. In addition, a Natural Heritage Trust project is being designed to help growers implement recommendations for fencing and revegetation identified in their Conservation Management Plans. Eighty growers were assessed, and it is likely that the scheme will be extended to other crops.

Nature Conservation Outcomes

The project has allowed access by Bushcare staff to a large number of properties in a landscape whose wildlife is under enormous pressure. Less than 1% of native vegetation on basalt soils is still extant within the region. All the properties, even those without any identifiable extant biodiversity of value, have had a conservation management plan written for them. The plans include a map showing which areas will be worked on to maintain and/or enhance nature conservation.

The response from the landowners varied enormously, but a number became very excited when they realised the value of what they had.

The project is being evaluated and the data collected properly attributed and documented. The preliminary results indicate that a number of very high priority sites were identified during the project, including the discovery of a number of threatened species and plant communities (identified in the Statewide Vegetation Management Strategy). Two of the threatened communities found were Saw Banksia (*Banksia serrata*) woodland and Coastal Grassy *Eucalyptus viminalis* forest on basalt. Both of these have highly restricted distributions. For these sorts of sites a more detailed conservation management plan will be developed by Bushcare with the landowner.

The Future

As far as I can determine, Nature's Choice is the first quality assurance scheme with a strong nature conservation component to be implemented in Australia in the mainstream market. Although ISO 14000 based approaches have been developed for food producers in Australia, it remains to be seen whether these will be capable of addressing nature conservation meaningfully or inspire consumer confidence. With Europe setting the pace in this area and the growing concerns about negative environmental outcomes flowing from global trade negotiations, Australian farmers have much to gain by having genuine and believable claims in respect of a clean and green product. There is absolutely no reason why the Nature's Choice approach can not be applied to all commodity sectors of the agricultural industry.

Whilst Bushcare and Land for Wildlife offered a perfect mechanism for delivering a credible assessment process, there is little prospect of the Bushcare Network being in place beyond 2002. Currently there is no non-governmental conservation organisation in Australia with the resources to deliver these services. One possible way forward would be to use the Land for Wildlife scheme to deliver a consistent product across the country. This would require the establishment of an accreditation process for independent assessors and a commitment by the host nature conservation agencies to maintain the property registers and service participants. It

would extend the current activities of Land for Wildlife but would establish the scheme and the logo as a credible deliverer of nature conservation assessments.

For more information, contact the author:

Sean Cadman, Bushcare, PWS, Department of Primary Industries, Water and Environment, Tasmania, 165 Westbury Road, Launceston, TAS. 7250. E-mail: Sean.Cadman@dpiwe.tas.gov.au
Ph: (03) 6336 5419; Fax: (03) 6344 8109

Further reading on ISO 14000 approaches:

- *Assessment of Ecologically Sustainable Forest Management in the South-West Forest Region of Western Australia*. Report of the Independent Expert Advisory Group. 1997. Commonwealth of Australia.
- The MGMT Alliance's website: <http://www.mgmt14k.com/0articles.html>
- This site gives a good insight into the role of ISO 14000 in the forest certification debate: <http://www.ulb.ac.be/assoc/iff/study/summary.htm>.

Protection for Marine Plants

Tasmania's Giant Kelp may become the first marine plant in Australia to be listed as a threatened species. Natural Heritage Trust funding has been provided for the Tasmanian Department of Primary Industries, Water and Environment to conduct research into why the kelp has become depleted along Tasmania's east and south coasts. Tasmania supported Australia's best Giant Kelp forests only 50 years ago, but since then numbers have fallen by 95%. These forests provide an important fisheries habitat.

Source: Marine and Coastal Network News.
Email: mccnsw@ozemail.com.au.
Ph: (02) 9436 0176

Can We Identify Surrogates of Bryophyte and Lichen Diversity?

Emma Pharo

Geography and Environmental Studies, University of Tasmania

The difficulty of identifying groups such as invertebrates, bryophytes, lichens and fungi means they are often excluded from biological surveys and ecological studies. Given the impossibility of monitoring all biodiversity, the concept of surrogates and indicator species for less well-known groups is vital for conservation and is widely used. But is this approach really ensuring that less well-known species receive adequate protection?

For many years, vascular plant communities have been used as surrogates for biodiversity, for obvious reasons. They are relatively easily surveyed both remotely and on the ground. They represent the bulk of the primary producer biomass and physical structure on which much of the rest of biodiversity depends. The recent Regional Forest Agreements and Comprehensive, Adequate and Representative Reservation negotiations have relied heavily on the assumption that forest types, which are often based only on dominant vascular plant species, are adequate surrogates for biodiversity.

However, the relationship between the surrogate or indicator and the entity that it is supposed to be indicating has rarely been rigorously tested and has several potential limitations (Lindenmayer 1999). The extent of any overlaps and exactly what is being indicated must be clearly defined. Good surrogates under one set of conditions may not be good surrogates under all conditions, such as different habitats, spatial and temporal scales. Responses to disturbance may be different for the surrogate and target group (Lindenmayer 1999). For example, the biology of both bryophytes and lichens are very different to vascular plants. Bryophytes, which are mosses, liverworts and hornworts; and lichens, which are a combination of an alga and a fungus; both lack roots. They draw most of their water and nutrients from the atmosphere and have limited control of the uptake and loss of water. Dispersal patterns are potentially different to those of vascular plants (with the exception of ferns) as bryophytes and lichens are spore dispersed and able to reproduce vegetatively from very small fragments; even single cells in the case of bryophytes.

Investigating the strength of surrogates

We conducted research in the forests of coastal New South Wales near Newcastle to investigate whether forest types can be reasonable surrogates for bryophyte and lichen species diversity (Pharo and Beattie, *in press*). We found that they can. We examined the five broad eucalypt-dominated forest types that were the focus of an environmental impact assessment in these production forests. These types ranged from forests in dry, exposed sites to riparian sites. The drier types differed substantially in both their bryophyte and lichen assemblages. The five forest types also differed significantly in their fire regime, moisture level and other related factors critical to bryophytes and lichens. So it appears that along with the vascular plants, bryophytes and lichens are responding to large-scale changes in the landscape. This is interesting given the considerable debate in the bryological and lichenological literature about the relative importance of large scale variables, such as fire or topography, versus small scale variables, such as presence of coarse woody debris, in controlling bryophyte and lichen distributions. Undoubtedly both are important and to a large extent interrelated; however, it is not difficult to imagine bryophytes typical of wet forests turning up in dry forests because there happens to be a moist sheltered spot available.



Are surrogates working to protect liverworts such as this species, Bazzania involuta? Photo: Emma Pharo

The other interesting facet of this debate is determining just how mobile bryophytes and lichens are. Suitable microsites are only an advantage if bryophytes and lichens are able to colonise them. Certainly some species are super-mobile, being able to disperse on jet streams and are found worldwide. One researcher glued bryophyte spores to the underside of a jet aeroplane's wings in an effort to show that the spores could be viable after such extreme travel. The spores germinated. This ability, however, may be limited and there has been little research done. Some experts assume that nearly all bryophytes and lichens can disperse across landscapes. Others assume that they can only disperse a few metres from the adult plant.

When we looked in more detail at correlations with groups of vascular plants, correlations were weaker than using the umbrella variable of 'forest type' (Pharo *et al.* 1999). The strongest correlation between the groups we examined was the positive relationship between bryophyte and fern species richness, ie areas that were rich in fern species were also rich in bryophyte species. Other important variables that could be surrogates for bryophyte and lichen species diversity include fire, topographic position, and other variables related to the moisture status of a site.

Our research showed that time since the last fire is a good predictor of both bryophyte and lichen species numbers and species composition (Pharo and Beattie 1997). For example, the sites burned in the last five or so years had quite different assemblages than sites protected from fire for more than 20 years. However, none of these correlations was particularly strong, and relationships should serve only as a guide to which areas might be the most diverse and worth further investigation.

Protected area overlap

In exploring whether areas protecting vascular plants overlap with areas valuable for bryophytes and lichens (Pharo 1996), we found that a suite of sites chosen for their vascular plant species also included around 90% of bryophytes and lichens. Also, if the set of sites was chosen using only dominant tree and sub-canopy species, most bryophytes and lichens were still included. This is good news in terms of biological surveys, because overstorey species are generally a small and easily identified group.

In terms of recommendations for surveying sites for protected areas, it appears that vascular plants, which is the group we have most commonly relied on as a surrogate for biodiversity, are probably an adequate surrogate.

To ensure that a range of non-vascular plant species are adequately protected as part of remnant vegetation reserves and other protected areas, the following things should be looked for:

- Areas which are rich in fern species - these are likely also to support a rich bryophyte flora
- Areas which have not been burnt in the last 10 years
- Low-lying areas or areas with a dense canopy of vascular plants and a high humidity
- A range of different types of habitat. Sites that cover a large proportion of vascular plant richness appear likely to cover a large proportion of bryophyte richness.

For more information, contact the author at Geography and Environmental Studies, University of Tasmania, GPO Box 252-78, Hobart, Tasmania 7001, Australia. Email: Emma.Pharo@utas.edu.au

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- Lindenmayer, D. B. 1999. Future directions for biodiversity conservation in managed forests: indicator species, impact studies and monitoring programs. *Forest Ecology and Management* 115, 277-287.
- Pharo, E. J. 1996. *Bryophyte and lichen diversity: patterns and conservation in production forests*. Ph.D. Dissertation, Macquarie University, Sydney, Australia.
- Pharo, E. J., and Beattie, A. J. 1997. Bryophyte and lichen diversity: a comparative study. *Australian Journal of Ecology* 22, 151-162.
- Pharo, E. J., and Beattie, A. J. (in press) Management forest types as a surrogate for vascular plant, bryophyte and lichen diversity. *Australian Journal of Botany*.
- Pharo, E. J., Beattie, A. J., and Binns, D. 1999. Vascular plant diversity as a surrogate for bryophyte and lichen diversity. *Conservation Biology* 13, 282-292.

Research Round-up

Welcome to this new section which aims to bring to the attention of plant conservation practitioners relevant recently published and on-going research that might inform their work. Contributions to this pages are welcome, as are comments about how we can make it more useful to you.

Species-specific research

Distribution, ecology and rarity of the nationally vulnerable species *Pultenaea selaginoides* (Fabaceae). A.J. J. Lynch. *Australian Journal of Botany*, 47 (6). 1999.

Seed germination in *Chrysophyllum* sp. nov., a large-seeded rainforest species in north Queensland: effects of seed size, litter depth and seed position. Peter T. Green. *Australian Journal of Ecology* 24(6), December 1999

Establishment and growth of seedlings of *Eucalyptus obliqua*: Interactive effects of litter, water, and pathogens. J. M. Facelli, R. Williams, S. Fricker and B. Ladd. *Australian Journal of Ecology*. 24(5), October 1999

Research into *Ptilotus aristatus* (var. *exilis* and *stenophyllus*) is being conducted by the Centralian Land Management Association to learn more about the biology of these nationally vulnerable plants which are restricted to the Mitchell grass country north-west of Alice Springs. For more information contact: Will Dobbie Ph: (08) 8953 4230

Rehabilitation

Australian trees for the rehabilitation of waterlogged and salinity-damaged landscapes. David T. Bell. *Australian Journal of Botany*, 47(5), 1999.

Ectomycorrhizas in *Eucalyptus tetradonta* and *E. miniata* forest communities in tropical northern Australia and their role in the rehabilitation of these forests following mining. Paul W. Reddell, Victoria Gordon and Michael S. Hopkins. *Australian Journal of Botany*, 47(6), 1999.

Research projects being conducted by the Australian Centre for Mining Environmental Research include Spinifex re-establishment, dormancy mechanisms of Australian native species and native understorey species regeneration at NSW coal mines. For more information contact them at Australian Centre for Mining Environmental Research Limited, PO Box 883, Kenmore Qld 4069, Australia.
Ph (07) 3212 4555; Fax 61 7 3212 4574;
Email c.bell@mailbox.uq.edu.au
Website: <http://www.acmer.com.au/>

Subalpine vegetation

Comparative effects of stock and wild vertebrate herbivore grazing on treeless subalpine vegetation, Eastern Central Plateau, Tasmania. K. L. Bridle and J. B. Kirkpatrick. *Australian Journal of Botany*, 47(6), 1999.

Rangelands

The National Land and Water Resources Audit has commissioned a project called *Developing an adaptive framework for monitoring biodiversity in the rangeland*. This is part of a program under the Audit to establish Australia-wide rangeland monitoring and reporting (for more information on the full program contact: rochelle.lawson@nlwra.gov.au). The biodiversity project will be conducted by the Tropical Savannas Cooperative Research Centre and will cover the entire rangeland, ie about 75% of the continent. For more information contact Don Franklin, Key Centre for Tropical Wildlife Management, Northern Territory University. Ph: (08) 8946 6574;
Email: don.franklin@ntu.edu.au

Fire

Factors affecting post-fire seedling establishment of selected Mallee understorey species. J. S. Cohn and R. A. Bradstock. *Australian Journal of Botany* 48(1), 2000.

Weeds

A useful article in the March 2000 *Growing Australian* – the newsletter of the Australian Plants Society, Victoria entitled "The Problem with Traditional Weeding Techniques" by Phil McNamara provides practical advice on the most effective way to tackle weeds.

Want to know more? Try some of these websites and information sources:

- Abstracts of all papers presented at the Ecological Society of Australia conference (Fremantle, Western Australia, 26 September - 1 October 1999). <http://life.csu.edu.au/esa/esa99/esa99abstr.html>
- Abstracts and papers published in the *Australian Journal of Botany* can be found at: <http://www.publish.csiro.au/journals/ajb/recent/recent.html>

- Abstracts and full papers from the Bushfire99 Conference, held in Albury in July 1999.
<http://life.csu.edu.au/bushfire99/papers/>

- Contents of the Australian Journal of Ecology can be found at <http://life.csu.edu.au/esa/esaaje.html>

- ARRIP (Australian Rural Research in Progress) is a national database of current and recently completed research undertaken in Australia on all aspects of agriculture, land, vegetation and water resources, and the rural environment. Access to ARRIP is currently free, but options for charging are being considered.
<http://www.infoscan.com.au/ARRIP/index.htm>

- *Growing Australian* – the newsletter of the Australian Plants Society, Victoria, contains a page called *Research Matters* which outlines plant related research being done around the country. Look up their website for more information:
<http://www.vicnet.net.au/~sgapvic/>

Book Review

By Patricia Hogbin

Flowers of the South Coast and Ranges of New South Wales II. A Field Guide.
Betty and Don Wood. 1999.

This pocket-sized and easy to use field guide to the flowers of the south coast and ranges of New South Wales contains 400 photographs illustrating common species which occur within the area, together with rarer species with which they might be confused. The book caters mainly for non-experts, and in the words of the authors, they hope it will "...increase the pleasure of residents and visitors to the South Coast during their walks and drives in the area, enabling them to identify the plants they see from the photographs..". This guide, however, is also an equally valuable resource for the more experienced botanist.

The guide covers the coast and escarpment of NSW extending from the Nowra district in the north, to the Victorian border in the south. It is the second in a series of two. The first book, *Flowers of the South Coast and Ranges of New South*

Wales, dealt with flowers common in coastal districts. This volume deals with additional coastal plants and also plants that are more common on the escarpment and the ranges. The two volumes together represent about two-fifths of the approximately 1800 species (excluding eucalypts, grasses and sedges) which occur in the area.

The guide is very simple and easy to use, with flower photographs grouped by colour. To identify a species, you choose its predominant flower colour, turn to the section covering that colour (identified in the margin) and simply look through the photographs in that section. The common and scientific name of each species, along with the family to which it belongs is given. Approximate flowering season and height is also provided. Each photograph is numbered, corresponding to a list of further notes in the back of the book.

The notes, although limited, give the habitat where the plant may be found, diagnostic features of plants difficult to identify, and distinguishing features of similar looking plants. As with any picture identification book, this guide will not always be suitable to identify accurately to species level. However, the guide is a valuable starting point prior to turning to additional sources.

Price: RRP A\$22 + GST

Published and distributed by: Wood's Books, 43 Mayo St, Weetangera, ACT 2614.

Ph: (02) 6254 2128 Fax: (02) 6254 2413



Nodding Greenhood (Pterostylis nutans): One of the plants featured in the book. Photo: Don Wood.

Plant Names by the Million

Botanists in three continents, including those from the Australian National Herbarium in Canberra, have announced the Internet launch of the *International Plant Names Index* (IPNI). This comprehensive listing of over 1.3 million scientific names for seed plants is the product of a collaboration between scientists and information technologists in Canberra and their partners at two other top botanical research institutions: the Royal Botanic Gardens at Kew, UK, and the Harvard University Herbaria, USA.

Although many scientific organisations have databases which hold records of plant names and details of their original publication, until now there has been no comprehensive, global system, freely available through the Internet. This million dollar project, jointly funded by the US National Science Foundation, Reuters Foundation, the US Geological Survey and the Headley Trust, represents a major step towards making accurate information on plant resources available throughout the world. IPNI will be used by biologists, conservationists, ecologists, horticulturists and ethnobotanists as a resource to check the names and publication details of the plants with which they are working. It is anticipated that it will also have a broader appeal as a 'plant name spell checker' for the estimated 250,000 seed plants in the world for anyone whose interests bring them into contact with scientific plant names eg. herbalists, journalists

and even keen gardeners. Eventually, links will lead the user from the name itself to other electronic sources of information on the tree, shrub or herb in question.

The need for a complete listing of all the world's plants by name has long been recognised. In 1882, just a few months before his death, Charles Darwin arranged a legacy of £250 a year for five years so that the Royal Botanic Gardens, Kew, could employ someone to produce just such a list. The eventual product, entitled *Index Kewensis*, contained some 400,000 names. However, new names continue to be published at the rate of up to 6,000 a year as new species are described and scientific understanding of relationships between organisms improves.

A similar list for the Australian flora, known as the *Australian Plant Name Index* (APNI), has been developed by scientists in Canberra (hosted by the Centre for Plant Biodiversity Research, CSIRO) over the last quarter century, while the Harvard contribution of plants from the New World was developed from a card index initiated in 1886.

One advantage of the Internet version is that the three organisations have combined and shared their information and expertise in contemporary database technology, allowing continuous updates from collaborators across the globe and real-time access to the results as they are entered.

Visit the *International Plant Names Index* site at:
<http://www.ipni.org/>

UPDATE ON ANPC PLANT CONSERVATION TECHNIQUES COURSES

The ANPC will be running its internationally renowned Plant Conservation Techniques Course on the North Coast of NSW and in Victoria later this year. Expressions of interest are currently being sought - for more information or to register your interest in attending, please contact Jeanette Mill at ANPC on (02) 6250 9509, email anpc@anbg.gov.au.

The ANPC Orchid Conservation Techniques Course proposed for May at Kings Park & Botanic Garden in Perth has been postponed. Due to interest levels and the need to access living material, this course will be held towards the end of the year, probably in early November. This will allow you to bring your favourite material to the course. Thank you to all who have already expressed interest, we will contact you with details in the near future.

If you have not yet registered your interest in this course or would like more information, please contact Dr Kingsley Dixon at Kings Park, Email: kdixon@kpbg.wa.gov.au
Fax (08) 9480 3641

CAN YOU HELP?

Reassessment of Populations of *Blandfordia cunninghamii*

The Sublime Point Bushcare Group in the Blue Mountains would like to hear from anyone who has information about *Blandfordia cunninghamii* in particular, or about *Blandfordias* in general. We are especially interested in the biology and ecology of these beautiful plants, and we would appreciate reliable information (preferably published) on:

- reproduction
- the stimulus for flowering
- the pollinator
- its distribution. We know about 50 separate locations so far, mostly in the upper Blue Mountains.

Any information would be more than helpful. Please contact: David Coleby: 11 Willoughby Road, Leura 2780. Phone and fax: (02) 4784 1395

Get Your Organisation Listed on the ANPC Website!

The ANPC website has links to many organisations' webpages, all of which are involved in plant conservation either in Australia or overseas.

We will be happy to add your organisation to the list. Please email brief details of what your organisation does, as well as your website address, to: anpc@anbg.gov.au



Publications & Information Resources

Where There's Smoke: Using Smoke to Germinate Australian Native Plants. A CD-Rom. 1999.

This CD-Rom describes how to use smoke germination at home, on the farm or in the nursery. It is the 1999 update of an earlier version.

Cost \$20, including postage and handling. Contact: Kings Park and Botanic Garden, West Perth, WA 6005. Ph: (08) 9480 3640; Fax: (08) 9480 3641; Email: plantsci@kpbg.wa.gov.au



Where there's
SMOKE

Using Smoke to Germinate
Australian Native Plants.

Cultivating Australian Native Plants. M. Reed. 1999. RIRDC.

Details the progress of five projects set up under an Australian Flora Foundation Inc. scheme.

Cost \$10. Order from Rural Industries Research and Development Corporation. Ph: (02) 6272 4819; Email: publications@rirdc.gov.au

Tasmanian Bushcare Toolkit. A guide to managing and conserving the bushland on your property. Bushcare and NHT. 2000

This ringbound toolkit includes sections on managing your bush, revegetating your farm, threatened plant species in your bush etc.

\$30 plus \$5 p&p. Order from: The Mail House, 22 Chesterman Street, Moonah, Tas 7009.

Ph: (03) 6272 5526

Email: mailhouse@oakenterprises.com.au

Guidelines for Representing Ecological Communities in Ecoregional Conservation Plans. 1999. The Nature Conservancy. Eds. Craig Groves and Laura Valutis

These guidelines are applicable to any large-scale conservation planning effort that is seeking to

incorporate the variety of communities and ecosystems within a set of conservation sites and nature reserves. ISBN 0-9624590-3-8

Practical Handbook for Population Viability Analysis. *Morris et al 1999. The Nature Conservancy.*

Provides practical yet rigorous advice for conservation practitioners on how and when they should conduct population viability analyses: quantitative methods to predict the likely future status of a population of conservation concern. ISBN 0-9624590-4-6

Both Nature Conservancy publications available in full in electronic PDF format at:

<http://consci.tnc.org/library/index.html>

Hard copies are also available. Contact Monica Perez at email: mperez@tnc.org

The Families of Flowering Plants of Australia. An interactive identification guide. *KR Thiele and LG Adams (eds). ABRIS. 1999*

This CD-Rom has been produced parallel to the publication of the new edition of Flora of Australia. It identifies plants at family level.

Cost \$69.95, plus \$8 p&p. If bought in conjunction with Flora Vol. 1, total cost is \$120. To order, contact CSIRO Publishing. Ph: 1800 645 051

Fax: (03) 9662 7555; Email: sales@publish.csiro.au
www.publish.csiro.au

Latest ACT Action Plans

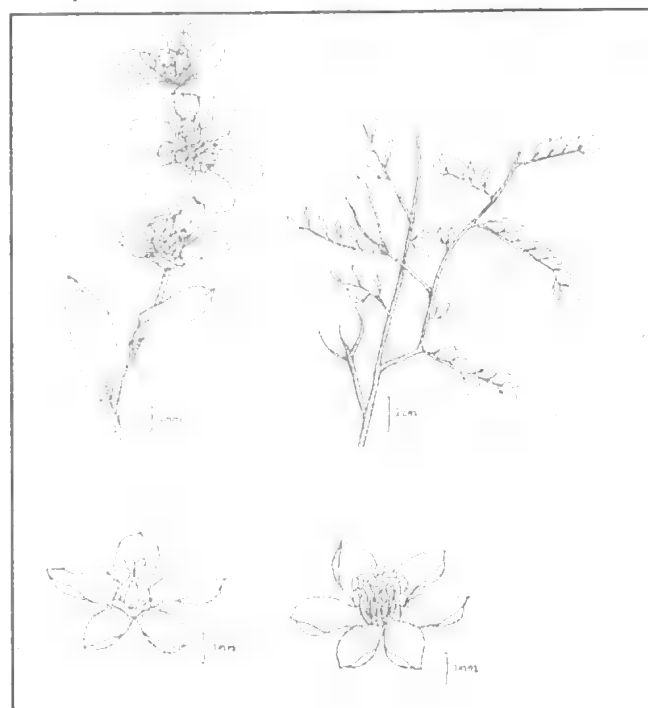
Action Plan 24. Tuggeranong Lignum. *Muehlenbeckia tuggeranong. An endangered species. Environment ACT, November 1999.*

Action Plan 10. Yellow Box/Red Gum Grassy Woodland (An Endangered Ecological Community). *Environment ACT, November 1999.*

These are the latest Action Plans from the ACT; both came out towards the end of 1999.

Available in full as electronic PDF files at <http://www.act.gov.au/environ/actionplans/index.html>

Or hard copies at \$5 each from Environment ACT, PO Box 144, Lyneham, ACT 2602. Ph (02) 6207 2126; email: EnvironmentACT@act.gov.au



Muehlenbeckia tuggeranong

Balancing Conservation and Production in Grassy Landscapes

Proceedings from the Clare Bushcare conference held in Clare SA from 19-21 August 1999, are now available. Free copies available from Environment Australia's Community Information Unit: freecall 1800 803 772

Native Seed in Australia: A survey of collection, storage and distribution of native seed for revegetation and conservation purposes. *Warren Mortlock, 1999.*

Report of a survey conducted by FloraBank in 1998 into the current state of play in Australia with seed collection. Contact Warren Mortlock, FloraBank coordinator for a copy on (02) 6281 8585

Australian Tropical Rainforest Trees and Shrubs. *Hyland, BPM., Whiffin, T., Christophel, DC., Gray, B., Elick, RW. and Ford, AJ. 1998*

This interactive identification system will help to identify 1733 species of trees and shrubs of northern Australian rainforests. It consists of a CD Rom and manual. ISBN 0 643 06047 2

RRP \$130 +p&p. To order, contact CSIRO Publishing: Ph: (03) 9662 7666 or 1800 645 051
Email: sales@publish.csiro.au

Electronic Addresses

Mycorrhizas Webpage

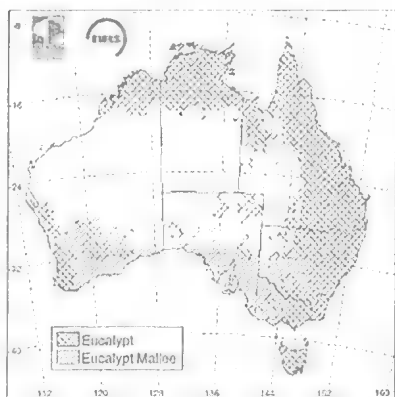
Created by CSIRO Forestry and Forest Products, this site contains an introduction to mycorrhizal associations, structure and development of roots and mycorrhizas, and information about Australian plants and fungi, as well as links to other sites for more information, including the Mycorrhiza Information Exchange Site.

<http://www.ffp.csiro.au/research/mycorrhiza/>

National Forest Inventory Australia

Aims to provide a single authoritative source of forest data at the national level. It covers public and private, native and plantation forests. It collates information about a wide range of forest characteristics such as their type, location, distribution, height, crown density, growth stage and/or planting date, ownership and protection status. For example, NFI databases can be used to calculate the extent of native forest cover in Australia; the extent of major forest types and their representation in conservation reserves or in areas listed as World Heritage, National Estate or as wilderness; changes in forest cover over time; and the tenure of forests, by forest type and by State or Territory. Hosted by the Bureau of Rural Sciences.

<http://www.brs.gov.au/nfi/>



A detail from the National Forest Inventory website (Eucalypt forest)

National Vegetation Information System (NVIS)

As part of the National Forest Inventory, a partnership has been established between the State/Territory and Commonwealth agencies to develop a cohesive national framework for compiling and communicating information about Australia's natural and exotic vegetation. The

goal of NVIS is to provide easily accessible and nationally consistent data on the extent and condition of Australia's vegetation, thereby improving the ability to make better natural resource management decisions.

Visit this site for more information about the system, which is still being established:

<http://www.brs.gov.au/nfi/nvis/index.html>

Fungimap Website

Fungimap is a collaborative project between professional and amateur mycologists and naturalists to gather information about the distribution of fungi throughout Australia (see *Danthonia* December 1999).

<http://calcite.apana.org.au/fungimap/>

Conferences

Scientists for Sustainability. National colloquia on sustainability of Australia's native forests in the 21st century and beyond

13-14 April 2000, Bateman's Bay, NSW
28 April, Canberra

Will address the key concepts and field practices surrounding the sustainability of native forests in Australia. For more info: www.sfs.unimelb.edu.au

Biodiversity in Urban Environments

1-2 June 2000, Adelaide

A national conference to explore the benefits and practicalities of conserving biodiversity in urban environments. Contact: SA Urban Forest Biodiversity Program, 5 Fitzgerald Rd, Pasadena SA 5042. Ph: 08 8372 0180; Fax: 08 8372 0199; Web: <http://www.urbanforest.on.net>

National Firewood Conference: A burning issue - woodland protection and firewood. Keeping both

8-9 June 2000, La Trobe University, Bendigo, Victoria

National conference organised by the Victorian National Parks Association to discuss and tackle the impact of firewood harvesting on biodiversity. Will feature a wide range of speakers from government and industry, through to environmentalists and farm foresters.

Contact conference organiser Karen Alexander.
Ph: (03) 5968 6274
Email: Karen@snowgumpress.com.au

Northern Grassy Landscapes Conference

29-31 August 2000, Katherine, NT

Theme: Striking a balance between production and conservation in the grassy landscapes of north Australia. Aimed at landowners and managers, community group members and coordinators, and people with an interest in conserving native vegetation. Fees will be relatively inexpensive and subsidised for land managers.

For more information contact:
Peter Jacklyn, Tropical Savannas CRC,
Ph: (08) 8946 6285; Fax: (08) 8946 7107
Email: peter.jacklyn@ntu.edu.au
<http://savanna.ntu.edu.au/news/grassy.html>

Fourth Australian Native Orchid Conference and Show

5 – 8 October 2000, Melbourne

Hosted by the Australasian Native Orchid Society (Vic. Group), the speaker program will include about 30 papers on topics ranging from terrestrial and epiphytic orchids in cultivation and in habitat, the latest in taxonomy and conservation programs for threatened orchids. Full registration is \$200.

Contact the secretariat for more information:
Ph: (03) 9850 9867

IUCN's Second World Conservation Congress

4-11 October 2000, Amman, Jordan

Expected to be the biggest environmental gathering ever in the Middle East, this congress will bring together members, Commission networks and partners to set the Union's focus for the first years of the new millennium. Although attendance is generally limited to invitation only, a limited number of interested members of the public may attend the Interactive Sessions, which will be held on 5 and 7 October 2000.



The World Conservation Union - IUCN

Visit the IUCN website for more information: <http://www.iucn.org/amman/index.html>

Open - work - applied work

Indigenous involvement in recovery projects on Aboriginal lands

15 April 2000. Workshop, Alice Springs

A forum for indigenous land managers, agencies and community groups working with threatened species on Aboriginal lands.

Contact: Colleen O'Malley Ph: (08) 8952 1541
Email: tsntt@ozemail.com

Regeneration in the Bayside Area. Australian Plants Society Vic Inc. weekend meeting

24 and 25 June 2000, Melbourne

Tours of remnant vegetation and revegetation projects in Melbourne's south-east region. Contact Allan Lowry (03) 9592 1024 or John Thompson (03) 9598 6982

The Threatened Plant Action Group Working Bees

South Australia

TPAG conducts working bees fortnightly throughout the year in South Australia. For a timetable or TPAG membership details contact Yvonne Steed on (08) 8339 3081

Recent Advances in Conservation Genetics

14- 27 August, 2000, USA

The Smithsonian Institution's Conservation & Research Center is running a two-week intensive course in methods, applications and interpretation of molecular genetic analyses of endangered species. This course will be taught by scientists with expertise and a variety of personal experiences in this important new field. Learn from recognised experts how to develop and interpret a wide range of genetic data using real examples, laboratory demonstrations and a variety of computer programs.

Cost: US\$2,000 (includes housing, meals, and ground transportation to/from Dulles International Airport). Limited financial aid is available.

More information: <http://rex.nci.nih.gov/lgd/congen/course.htm>

Email: noahscrc@ncifcrf.gov; Ph: 301/846-1299

**Biodiversity Assessment and Monitoring for Adaptive
Management
Environmental Leadership
2000, USA**

The Smithsonian Institution's Monitoring and Biodiversity Program (SI/MAB) are running two courses in 2000; one on Biodiversity Assessment and Monitoring for Adaptive Management (May 14 - June 16th) and the other on Environmental Leadership (September 10th - 22nd). For more information, contact Christopher Ros.
Email: cjr@ic.si.edu. Ph: 202 786 3116
Website: www.si.edu/simab

**Kings Park and Botanic Garden 2000, Wildflower
Festival**

October 6 - 15, 2000. Perth, WA

This festival will include a native wildflower display: with over 200 wildflowers on show and identified; native gardens: learn more about growing native plants in your garden; growing science: talk to researchers and see displays on wildflower research and bushland management; guided bushwalks: view native plants in Kings Park with bush guides.

Further information: Visitor Services, Kings Park and Botanic Garden, West Perth WA 6005.

Ph: (08) 9480 3600.

Email: postmaster@kpbg.wa.gov.au

Website: <http://www.kpbg.wa.gov.au/wff/wildflowerfest.html>

**Threatened Species Network
Community Grants 2000**

The TSN Community Grants assist community groups in the conservation and recovery of populations of nationally threatened species and ecological communities.

The next round will be advertised in late April with applications closing in late June. Contacts for more information as follows:

NSW: Francesca Andreoni (02) 9281 5515
VIC: Felicity Faris (03) 9650 8296
TAS: Peter McGlone (03) 6234 3552
SA: Vicki Jo Russell (08) 8223 5155
QLD: Mike Gregory (07) 3221 0573
NT: Colleen O'Malley (08) 8952 1541
WA: Sandra McKenzie (08) 9387 6444

Regional Groups

Sydney Region

Tracey Armstrong, Mount Annan Botanic Gardens

In December, 1999, Jeanette Mill, Richard Johnstone and I joined Sarah Burke of the NSW National Parks and Wildlife Service in a search for new populations of *Allocasuarina portuensis* in suburban Sydney. I am hoping that this will herald the start of a long, beautiful and productive surveying partnership between ANPC and the Service.

The aim of the exercise was for ANPC members to assist NPWS staff to complete surveys for rare or threatened plant species in likely habitats. At present, NPWS is writing recovery plans for many species, and their implementation often depends on active community involvement, especially in defining species distribution and therefore level of threat. This is where interested ANPC members can help. Working with NPWS, we can help provide this information and so increase the accuracy and usefulness of the recovery plans. Working with the Service means we can make a considerable positive contribution to the conservation of threatened plants. And as the current Royal Botanic Gardens, Sydney slogan succinctly states: Plants = Life.

It would be great if other regions also contacted their NPWS or equivalent to see if other partnerships could be created. And if you live in an area which doesn't have a Regional Group, maybe you could start one - it's not all that hard to do, and the ANPC National Office and I will help.

If you're wondering how we went in our search for *Allocasuarina portuensis*, then I'm afraid that we didn't find any other populations, and it remains a very threatened species. If you're interested in joining in with the Sydney Region's partnership, please contact Sarah Burke and Chris Lacey at NPWS, or myself:

Contacts:

- Tracey Armstrong, Regional Coordinator
Ph: 02 4634 7939
Email: Tracey_Armstrong@rbgsyd.gov.au
- Sarah Burke, Ph: 02 9585 6912
Email: sarah.burke@npws.nsw.gov.au
- Chris Lacey, Ph: 02 9585 6821
Email: christopher.lacey@npws.nsw.gov.au

NSW South West Slopes Region

Paul Scannell, Albury Botanic Gardens

The activities of the *Caladenia concolor* (Crimson Spider Orchid) Recovery Team continue. The team has identified security as a major threat to the site. Fencing is a priority to enable some control over possible threats.

Gillian McDonald, from the Department of Land & Water Conservation in Albury, did a great job in putting together successful submissions to the NSW Biodiversity Strategy and Crown Lands Weed Grants. The money went towards enabling Australian Trust for Conservation Volunteers to carry out works required including fencing repairs, weed removal, seed collecting for revegetation to improve and increase habitat for wildlife, nesting boxes for Turquoise Parrots, noxious weed spraying by Albury City Council, staying away from sensitive areas. The volunteers came from South Korea, Canada, USA, UK, Belgium and all over Australia to participate, and their hard work and achievements are greatly appreciated by all. Stock grazing of the firebreak was conducted to reduce the fuel level after spring rains caused lush growth.

King's Park and Botanic Garden, Perth are investigating a similar, but as yet unidentified, species from a strong population at Bethungra.

Trials will be conducted on germination, culturing and re-introduction and the results will be used by the Recovery Team to determine policy for future research on the Crimson Spider Orchid.

Contact: Paul Scannell (ANPC Regional Coordinator), Albury Botanic Gardens.

Ph: (02) 6023 8241; Fax: (02) 6041 6527

E-mail: accgardn@albury.net.au



Volunteers involved in threatened species surveys near Albury, NSW. Photo: Paul Scannell

Tasmanian Region

For information about the group, please contact coordinator Andrew Smith on:

Ph: (03) 6233 2185; Fax: (03) 6233 8308

Email: andrews@dpiwe.tas.gov.au

The Australian Network for Plant Conservation Inc. Membership List

The date in brackets indicates that the member has joined or renewed for that year. Addresses and names of contact persons are available from the National Office. *Note:* Memberships are valid for the calendar year.

Corporate Members

ACT Parks & Cons. Service (1998)
Adelaide Botanic Gardens (2000)
Albury Botanic Gardens, NSW (2000)
Alcoa of Australia Ltd, WA (2000)
Australian National Botanic Gardens (2000)
Aust Tree Seed Centre, CSIRO (1999)
Biodiversity Group, Environment Australia (2000)
Brisbane Botanic Gardens, Qld (2000)
Caloundra City Council, Qld (1998)
Centre for Plant Biodiv. Rsch, ACT (1999)
Centre for Plant Conservation Genetics, NSW (2000)
Coffs Harbour City Council, NSW (2000)
Council of the City of Orange, NSW (2000)
CSIRO Publishing (1999)
Defence Estate Organisation, ACT (1998)
Dept. of Conservation and Land Management, WA (1999)

Environment ACT (1999)
Eurobodalla Bot Garden, NSW (1999)
Flecker Botanic Gardens, Qld (1999)
Forestry Tasmania (1999)
Gladstone Tondoon Botanic Garden, Qld (1998)
Kings Park and Botanic Gardens, WA (2000)
Logan City Council, Qld (1998)
Macedon Ranges Shire Council, Vic (1999)
Maroochy Shire Council, Qld (1998)
Minerals Council of Aust, ACT (1999)
Mt Tomah Botanic Garden, NSW (1998)
Norfolk Island Botanic Garden (1999)
North Forest Products, Tas (1998)
NSW National Parks & Wildlife Service (1999)
Olympic Coord. Authority, NSW (1998)
Pacific Power, NSW (1998)
Parks and Wildlife Commission, NT (2000)
Parks Australia — North, Christmas Island (1999)

Queensland Herbarium (2000)
Queensland Parks and Wildlife Service (2000)
Randwick City Council, NSW (1998)
Redland Shire Council, Qld (1999)
RGC Mineral Sands, WA (1998)
Roads and Traffic Authority NSW (1999)
Royal Botanic Gardens, Melbourne, Vic (1999)
Royal Botanic Gardens, Sydney, NSW (2000)
Royal Tasmanian Botanical Gardens (1999)
Standing Committee on Forestry, ACT (1999)
Strathfield Municipal Council, NSW (1999)
Tas. Dept. Primary Industries, Water & Environment (1999)
Townsville City Council, Qld (1999)
WMC Olympic Dam, SA (2000)
Wollongong Botanic Gardens (1999)
Zoological Parks Board of NSW (2000)
Zoological Board of Victoria (1999)

International Associates

Auckland Plant Collections Network, NZ
 Botanic Gardens Conservation Intl, UK
 Botanical Research Institute of Texas
 Botanischer Garten und Botanisches,
 Germany
 David Brackett, SSC, IUCN
 Canadian Botanical Conservation Network
 Center for Plant Conservation, USA
 Columbus Zoo, Ohio, USA (1998)
 Conservatoire et Jardin Botaniques,
 Switzerland
 Don Falk, USA
 Darren Crayn, Florida, USA (2000)
 Georgia Endangered Plant Stewardship
 Network, USA
 David Given, NZ (1997)
 Craig Hilton-Taylor, UK
 Honiara Botanic Gardens, Solomon Islands
 Indian Society for Conservation Biology
 Indonesian Network for Plant Conservation
 Clive Jermy
 Kebun Raya Indonesia
 Noelline Kroon, South Africa (1999)
 Missouri Bot. Gardens Library (1999)
 Dr Neil Mitchell, NZ (1999)
 Suresh Narayana, India
 National Botanical Institute, South Africa
 Jeanine Pfeiffer, USA
 PlantNet, UK
 Provincial Museum of Natural Sciences,
 Argentina
 Rare Plant Consortium, Canada
 Royal Botanic Gardens, Kew, UK (2000)
 SABONET, South Africa
 Society for Ecological Restoration, USA,
 (1998)
 Pritpal Soorae, IUCN/SSC, Kenya
 Mark Stanley-Price, IUCN/SSC, Kenya
 Dr I Wayan Sumantera, Indonesia
 Suva Botanical Gardens, Fiji
 Roy Taylor, Canada (1998)
 Andrew Townsend, Dept. Cons., NZ (1998)
 Marika Tuiwawa, University of the South
 Pacific (2000)
 Vailima Botanic Gardens, Western Samoa
 Wellington Plant Conservation Network
 Mohamed Zackeriya, Sri Lanka

Other Organisations

ARAZPA (2000)
 Assn. of Soc. for Growing Aust Plants (2000)
 Australian Arid Land Botanic Garden, SA
 (1999)
 Aust Assn. of Bush Regenerators (1998)
 Aust. Inland Botanic Gardens, Vic (2000)
 Aust. Plants Society Newcastle Group Inc.
 (2000)
 Aust. Plants Society Central West Group
 (1999)
 Aust. Plants Society, NSW (1999)
 Aust. Plants Society South West Slopes,
 NSW (1999)
 Aust. Trust for Conservation Volunteers
 (1997)
 Blue Mountains Wildplant Rescue Service,
 NSW (1999)
 Brunswick Valley Heritage Park, NSW (2000)
 Burnley College, Vic (2000)
 Burrendong Arboretum Trust, NSW (1999)
 Community Biodiversity Network (2000)

Dept Land and Water Cons'n, NSW (2000)
 Friends of ANBG, ACT (2000)
 Friends of Eurobodalla BG, NSW (1999)
 Friends of Grasslands, ACT (2000)
 Friends of North Coast Regional BG, NSW
 (1999)
 Friends of Warrandyte State Park, Vic (1998)
 Greening Australia (ACT/SENSW) (1999)
 Greening Australia Ltd (2000)
 Greening Australia (NSW) (1999)
 Greening Aust Sth West Plains, NSW (1999)
 Greening Aust Sth West Slopes, NSW (1998)
 Greening Australia (Vic) (1997)
 Hunter Region Botanic Gardens, NSW
 (2000)
 Indigenous Flora & Fauna Assn (2000)
 Lismore Rainforest Bot. Garden (1998)
 Merri Creek Management C'ttee, Vic (2000)
 Monarto Zool. Park, SA (1999)
 Myall Park Botanic Garden, Qld (1998)
 National Herbalists Assn of Aust (2000)
 National Threatened Species Network (2000)
 NSW Roadside Env't. C'ttee (1999)
 Olive Pink Botanic Garden, NT (1999)
 Pangarinda Arboretum, SA (2000)
 Royal Aust Institute of Parks & Recreation
 (1998)
 Royal Geographical Society of Qld (1999)
 Royal Zoological Society of SA (1998)
 SGAP Blue Mtns Group, NSW (2000)
 SGAP — Canberra Region Inc. (2000)
 SGAP — Dryandra Study Group (1999)
 SGAP — Far Nth Coast Gp, NSW (1998)
 SGAP — Ipswich Branch, Qld (1999)
 SGAP — North Shore, NSW (1998)
 SGAP — Northern Group, Tas (1999)
 SGAP — North West, Tas (1998)
 SGAP — Queensland Region (1999)
 Stony Range Flora Reserve, NSW (1998)
 Tasmanian Arboretum Inc. (1999)
 Trust for Nature (Victoria) (2000)
 Understorey Network, Tasmania (1997)
 Wallum Action Group, Qld (1997)
 Wildflower Society of WA (1999)
 Wildflower Society of WA, Nth Suburbs
 (2000)
 Wildlife Preservation Society of Australia,
 NSW (1999)
 World Wide Fund for Nature Australia (1999)

Individual Members

Gail Abbott, NSW (1998)
 Dr David Aldous, Vic (1998)
 Diane Allen, Qld (1999)
 Jan Allen, NSW (1999)
 Ian Anderson, ACT (2000)
 Benjamin Armstrong, NSW (1999)
 Richard Arnett, NSW (1998)
 N. Ashwath, Qld (1999)
 Margaret Bailey, NSW (1999)
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